

OPERATING SUMMARY

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KINGSTON TWP.

1973

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KINGSTON TWP.
WATER POLLUTION CONTROL PLANT

operated for
THE TOWNSHIP OF KINGSTON
by the
MINISTRY OF THE ENVIRONMENT

1973 ANNUAL OPERATING SUMMARY

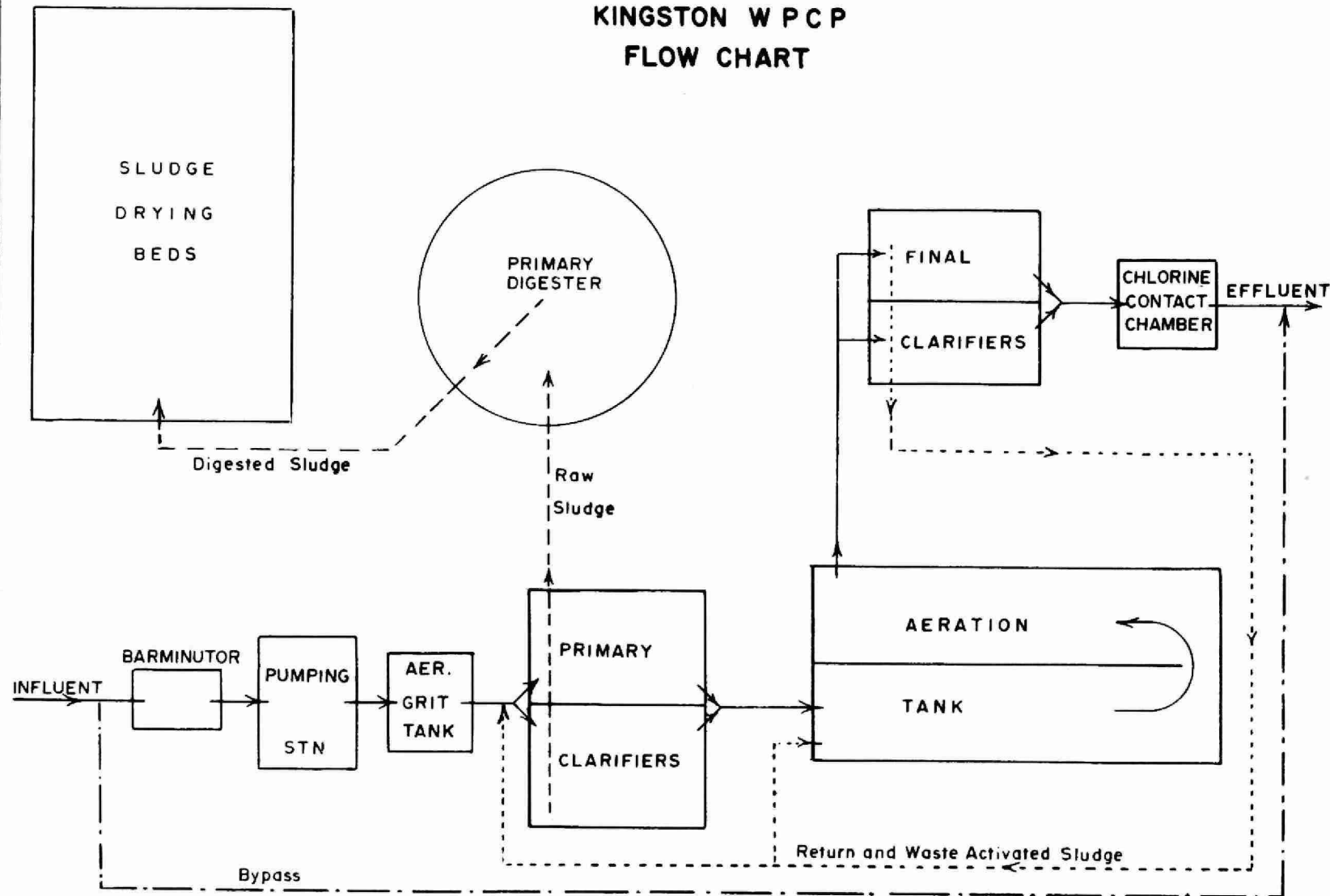
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KINGSTON WPCP FLOW CHART



DESIGN DATA

PROJECT NAME Kingston Twp WPCP

PROJECT NO. 2-0098-61

TREATMENT Activated Sludge

DESIGN FLOW 0.83 mgd

DESIGN POPULATION 10,000

BOD - Raw Sewage 210 mg/l

SS - - Raw Sewage 250 mg/l

PRIMARY TREATMENT

Comminution

Type: C. P. Barminutor
Size: One Model C (18')

Sewage Lift Pumps

Type: Weinman Type VBM
Size: Two 1200 gpm @ 35' tdh

Grit Removal

Type: Aerated; grit removed by air lift
Size: 1920 gal
Retention: 2 min

Primary Sedimentation

Type: Falk
Size: Two 46' x 12' x 7'7" deep
(8,380 cu ft or 52,200 gal)
Retention: 1.5 hours
Loading: Surface, 750 gal/ft²/day
Weir, 8,600 gal/ft/day

SECONDARY TREATMENT

Aeration Tanks

Type: Diffused air; Two-pass
Size: One tank 62' x 22.5' x 15'
(each pass) (41,900 cu ft
or 262,000 gal)
Retention: 7.6 hours

Air Supply

Type: Roots-Connorsville
Size: Two 880 scfm

Diffusers

Type: C. P. Discfuser
Space: 63 diffusers per pass
(wide band)

Secondary Sedimentation

Type: Falk
Size: Two 56' x 12' x 9' deep
(12,100 cu ft or 75,600 gal)
Retention: 2.2 hours
Loading: Surface, 562 gal/ft²/day
Weir, 5,050 gal/ft/day

CHLORINATION

One W & T (100 lb/day)

Chlorine Contact Chamber

Size: One 27' 9" x 9' x 8' deep
(10,300 gal)
Retention: 18 min

OUTFALL

3,000 ft to Lake Ontario

SLUDGE HANDLING

Digestion System

Type: Single stage, mixed by sludge recirculation
Size: One 55' dia x 20' swd
(54,500 cu ft or 340,000 gal)
Loading: 0.57 lb/cu ft/mo
Recirculation pump - one Weinman:
150 gpm @ 65'

Sludge Drying Beds

Four 80' x 20' (6,400 sq ft)

'73 Review

GENERAL

The addition of polyelectrolytes at the Water Pollution Control Plant was discontinued early in the year as the improvement in plant performance no longer justified the high chemical costs. The deterioration in effectiveness of this and other types of chemical treatment experimented with, such as hydrogen peroxide, resulted from increasing hydraulic overloading. Following abandonment of chemical treatment, the plant flow was split with flows up to 1.0 million gallons per day receiving full secondary treatment and flows in excess of 1.0 million gallons per day receiving only primary treatment. Year-round chlorination of all flows commenced in March of 1973.

A pilot plant research study conducted by staff of the Royal Military College and Queens University was completed during the year. The study, concerning the effect of adding alum sludge from a water treatment plant to sewage entering a water pollution control plant, concluded that the addition of alum sludge improved the efficiency of the water pollution control plant in the removal of phosphorus from the sewage.

A program to coat the pump shaft sleeves at all of the pumping stations with a ceramic coating to reduce maintenance costs was initiated. The Flowmatcher controls in the Days Road and Crerar Street pumping stations were removed and the pumps converted to single-speed stop/start operation. The Collins Bay pumping station generator building brickwork was repointed. This building has suffered structural deterioration and may have to be reconstructed in the near future.

Tenders were received in December for expansion of the plant, tripling its capacity to 2.4 million gallons per day. Construction is scheduled to commence early in 1974.

EXPENDITURES

The cost of operating the sewage works in 1973 was \$60020, slightly lower than in the previous year and within the operating budget. The cost of treating one million gallons of sewage was \$105, down from \$117 per million gallons in 1972.

PLANT PERFORMANCE

Flows for the year totalled 569 million gallons, up from 549 million gallons during the previous year. The average daily flow increased from 1.50 million gallons per day in 1972 to 1.56 million gallons per day in 1973.

The sewage BOD was reduced by 56 per cent from an influent concentration averaging 290 mg/l to an effluent concentration of 130 mg/l. The sewage suspended solids was reduced by 45 per cent from an influent concentration averaging 270 mg/l to an effluent concentration of 150 mg/l. Phosphorus concentrations averaged 9.1 mg/l in the influent and 7.4 mg/l in the effluent, for a reduction of 19 per cent.

A total of 1,296 million gallons of raw sludge was pumped to the digesters. Of the 148 thousand gallons of digested sludge removed from the plant, 73 thousand gallons was hauled in liquid form for land disposal and the remaining 75 thousand gallons was directed to the drying beds. The plant effluent was disinfected with a total of 16.7 thousand pounds of chlorine.

PLANT LOADING

Flows during 1973 averaged 188 per cent of plant design capacity, up from 181 per cent in 1972. The BOD loading decreased from 270 per cent of design capacity in 1972 to 260 per cent in 1973. The suspended solids loading increased from 184 per cent of design capacity in 1972 to 203 per cent of design capacity in 1973.

The pumping stations within the sewage collection system have sufficient capacity to handle normal sewage flows. However, the Days Road and Crerar Street pumping stations are unable to handle the surges of flow during periods of wet weather, due to rain water entering the sanitary sewer system.

CONCLUSIONS

The plant efficiency was very poor as a result of severe hydraulic and organic overloading. The quality of the plant effluent was also ver poor, averaging 130 mg/l BOD and 150 mg/l suspended solids. These concentrations are equivalent to the strength of raw sewage in many municipalities.

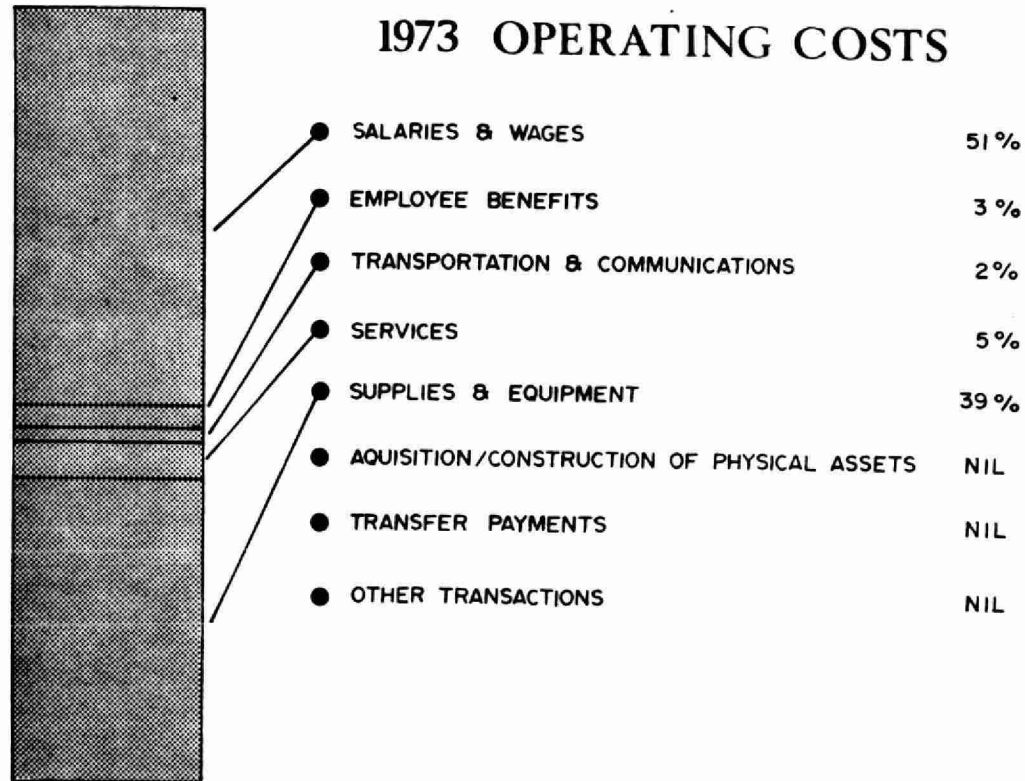
Expansion of the plant to 2.4 million gallons per day capacity scheduled for completion by the end of 1974 is an absolute necessity. However, even the expanded plant may be overloaded hydraulically during periods of wet weather unless continuing efforts are made by the municipality to locate points of entry of rainwater to the sanitary sewer system and eliminate these flows.

The plant superintendent, Mr. Jack Cleland and his capable staff are to be commended for their high standards of maintenance and operation under very trying conditions.

OPERATING EXPENDITURES

SALARIES AND WAGES	<u>\$30,445</u>
EMPLOYEE BENEFITS	<u>1,722</u>
TRANSPORTATION & COMMUNICATIONS	<u>1,135</u>
SERVICES	<u>3,028</u>
SUPPLIES AND EQUIPMENT	<u>23,690</u>
ACQUISITION/CONSTRUCTION OF PHYSICAL ASSETS	<u>0</u>
TRANSFER PAYMENTS	<u>0</u>
OTHER TRANSACTIONS	<u>0</u>
TOTAL	<u>\$60,020</u>

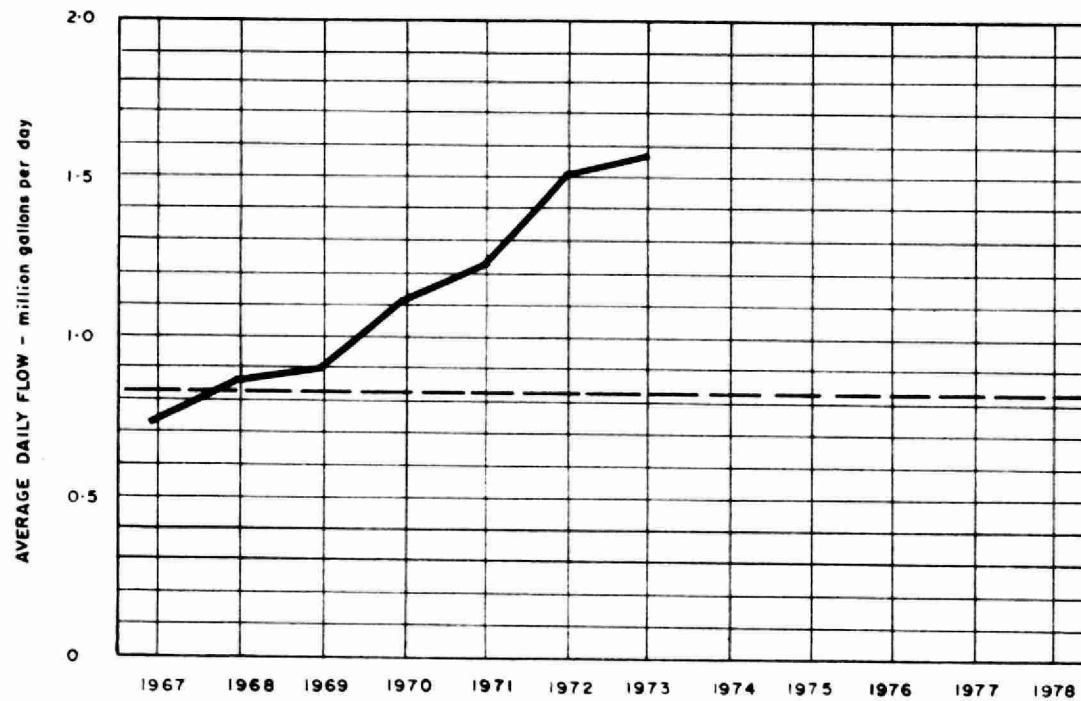
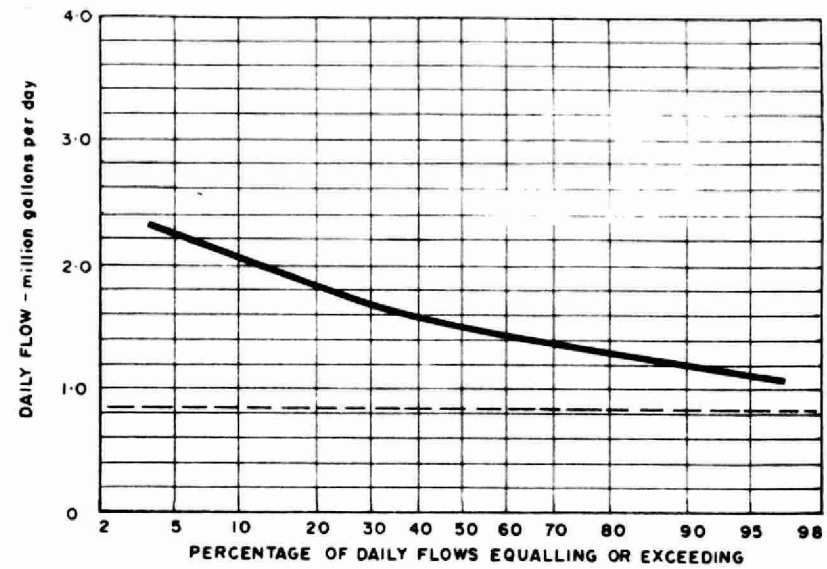
ANNUAL COSTS



YEARLY OPERATING COSTS

YEAR	SEWAGE TREATED in million gallons	TOTAL OPERATING COSTS	UNIT COSTS	
			\$/M.G.	¢/lb BOD
1968	314	\$ 36,456	116	2
1969	345	39,254	114	3
1970	408	44,857	110	7
1971	454	51,491	113	8
1972	549	64,452	117	5
1973	569	60,020	105	2

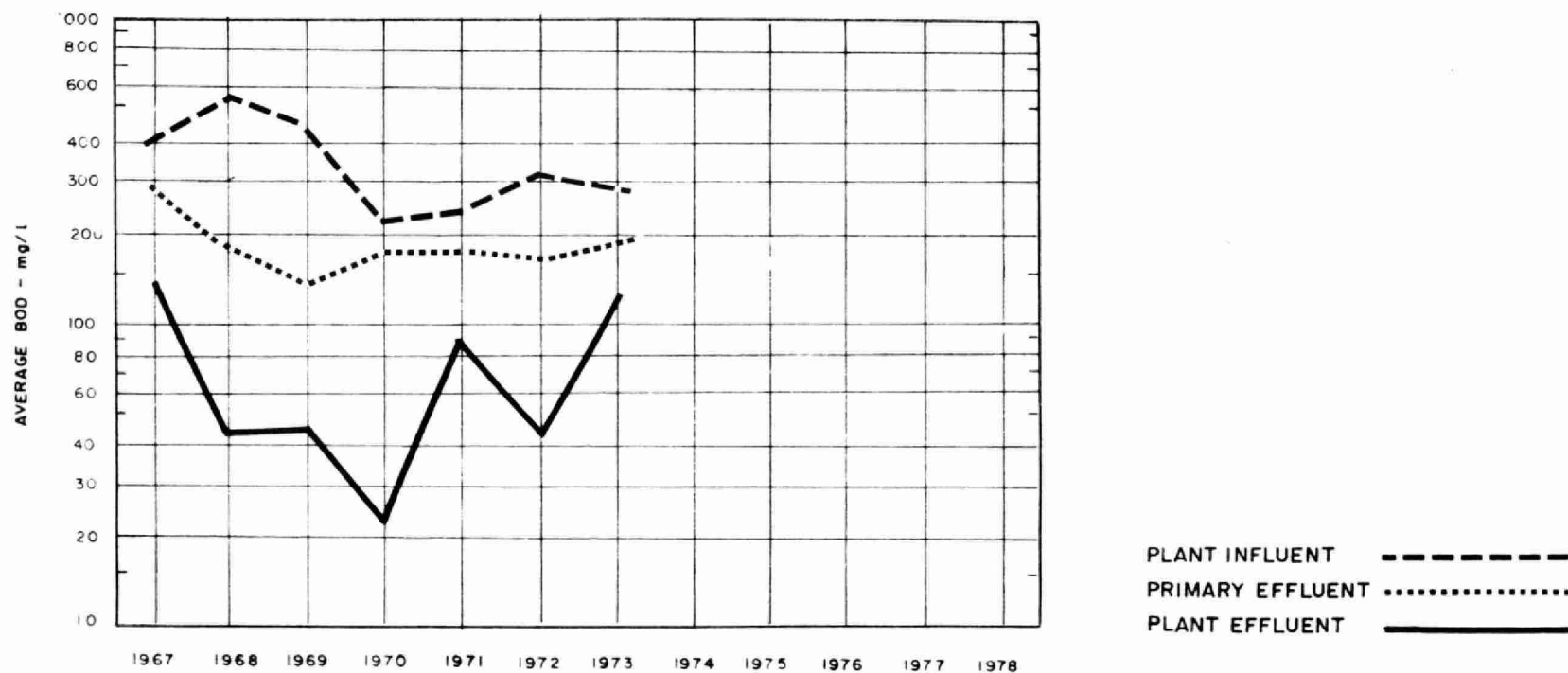
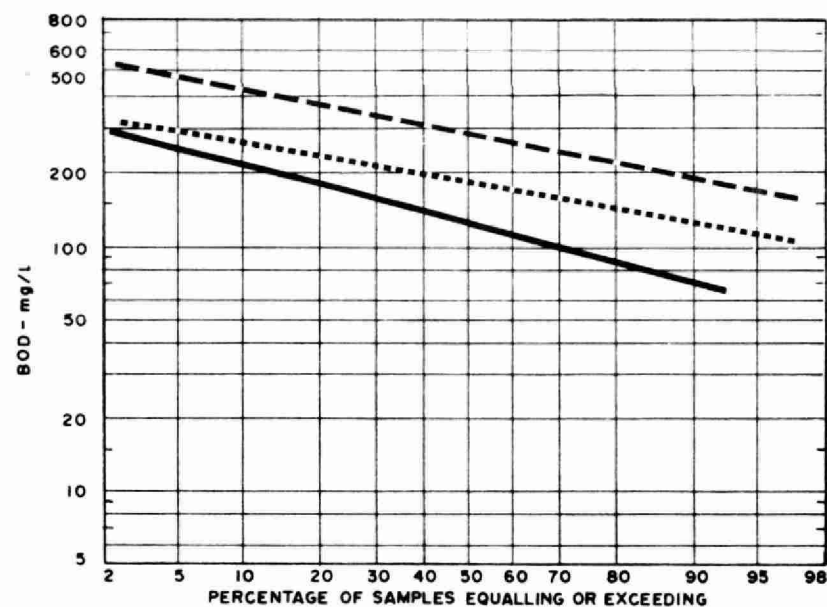
PROCESS DATA FLOWS



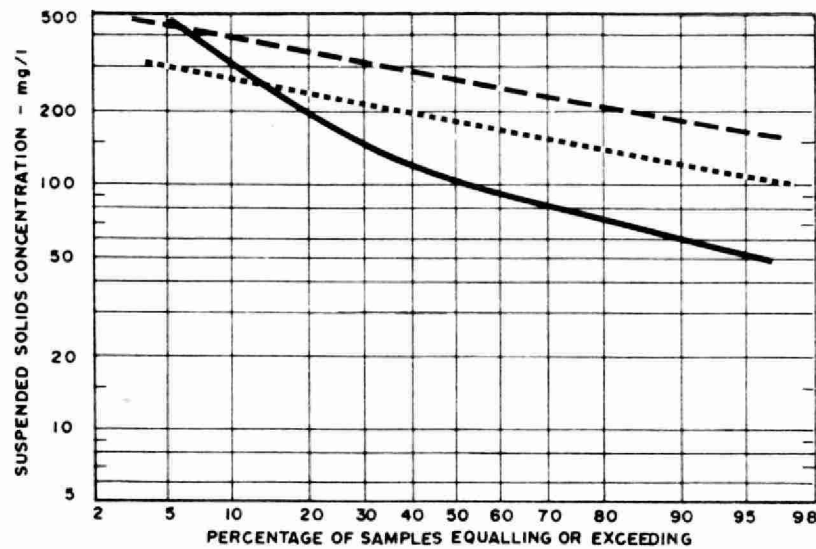
PLANT PERFORMANCE

MONTH	FLOWS			BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS				PHOSPHORUS	
	TOTAL FLOW	AVERAGE DAY	MAXIMUM DAY	INFLUENT	EFFLUENT	REDUCTION		INFLUENT	EFFLUENT	REDUCTION		INFLUENT	EFFLUENT
	million gallons	mil. gal	mgd	mg/l	mg/l	%	10 ³ pounds	mg/l	mg/l	%	10 ³ pounds	mg/l P	mg/l P
JAN	49.81	1.61	2.38	260	100	60	78	260	150	43	55	11.0	7.3
FEB	36.42	2.80	2.39	280	120	56	64	310	130	58	64	11.0	9.4
MAR	49.03	1.58	2.38	260	150	41	51	250	210	16	20	11.0	8.4
APR	52.34	1.74	2.42	220	130	41	48	190	130	32	32	6.5	4.5
MAY	44.42	1.43	1.70	310	150	52	72	270	91	66	78	9.7	6.4
JUNE	40.28	1.34	1.73	300	110	64	79	240	83	66	64	8.4	6.4
JULY	40.69	1.31	1.57	280	98	64	72	230	140	41	39	6.2	10.0
AUG	44.87	1.45	2.11	280	180	38	48	240	240	0	0	7.5	16.0
SEPT	46.13	1.54	2.17	290	100	65	87	430	230	45	89	4.5	5.0
OCT	48.14	1.55	2.19	340	120	64	104	270	110	60	78	7.8	5.4
NOV	55.73	1.86	2.39	360	130	57	124	310	180	40	69	4.6	3.8
DEC	60.90	1.96	2.41	340	130	62	128	300	97	67	121		
TOTAL	568.76	-	-	-	-	-	955	-	-	-	709	-	-
AVG.		1.56	MAXIMUM 2.42	290	130	56	80	270	150	45	59	9.1	7.4
No. of Samples	-	-	-	61	61	-	-	61	60	-	-	15	15

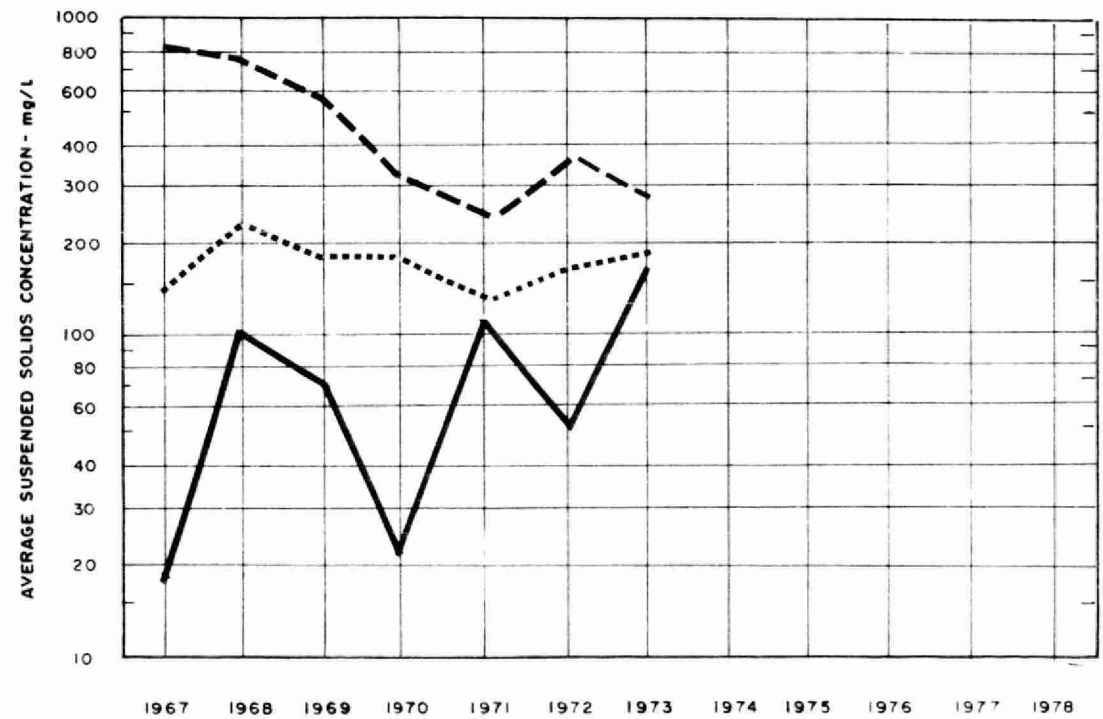
BIOCHEMICAL OXYGEN DEMAND



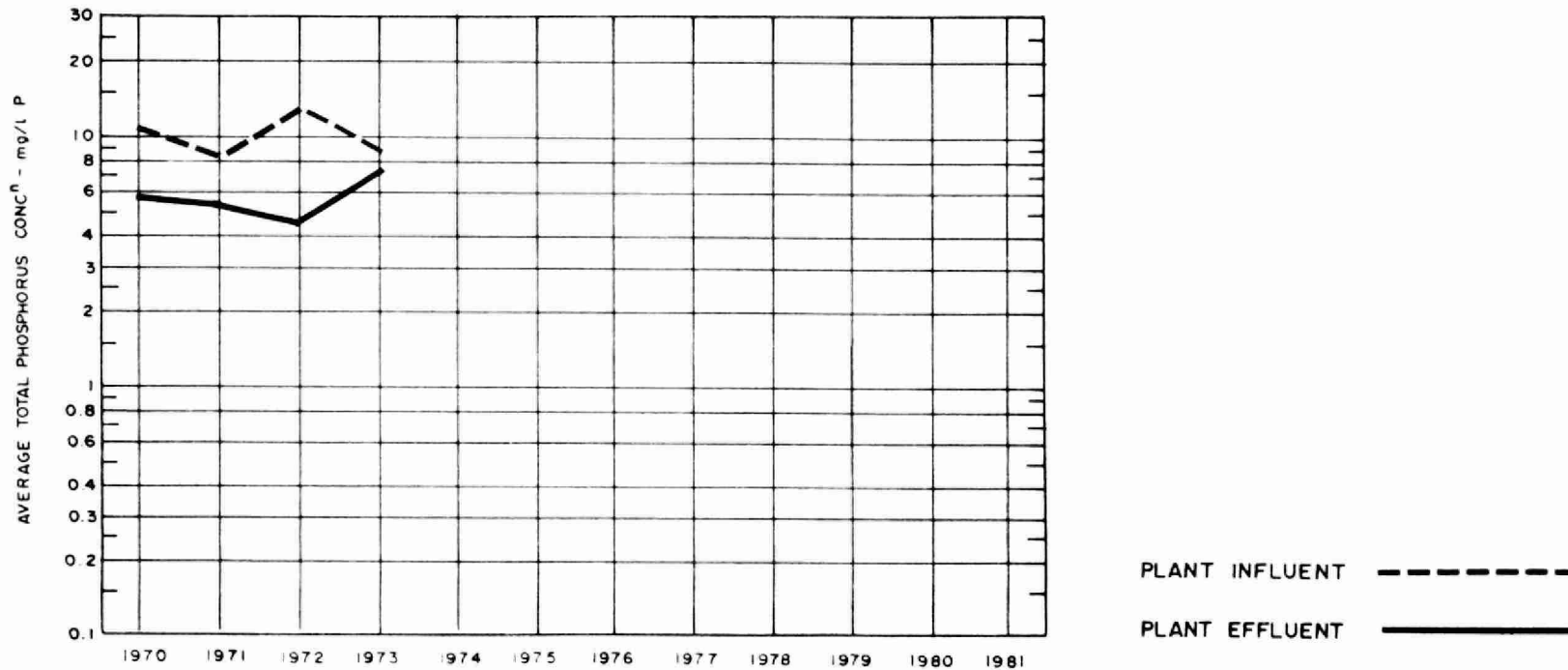
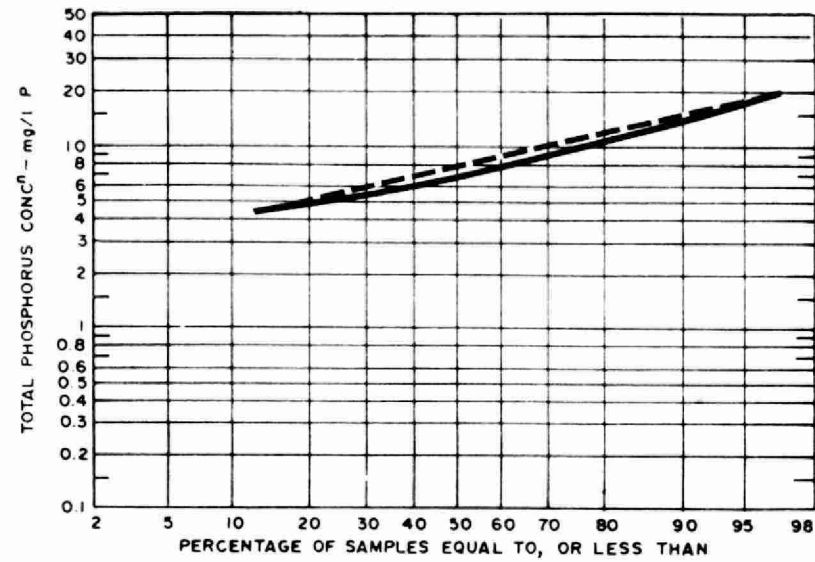
SUSPENDED SOLIDS



PLANT INFLUENT - - - - -
 PRIMARY EFFLUENT
 PLANT EFFLUENT —————

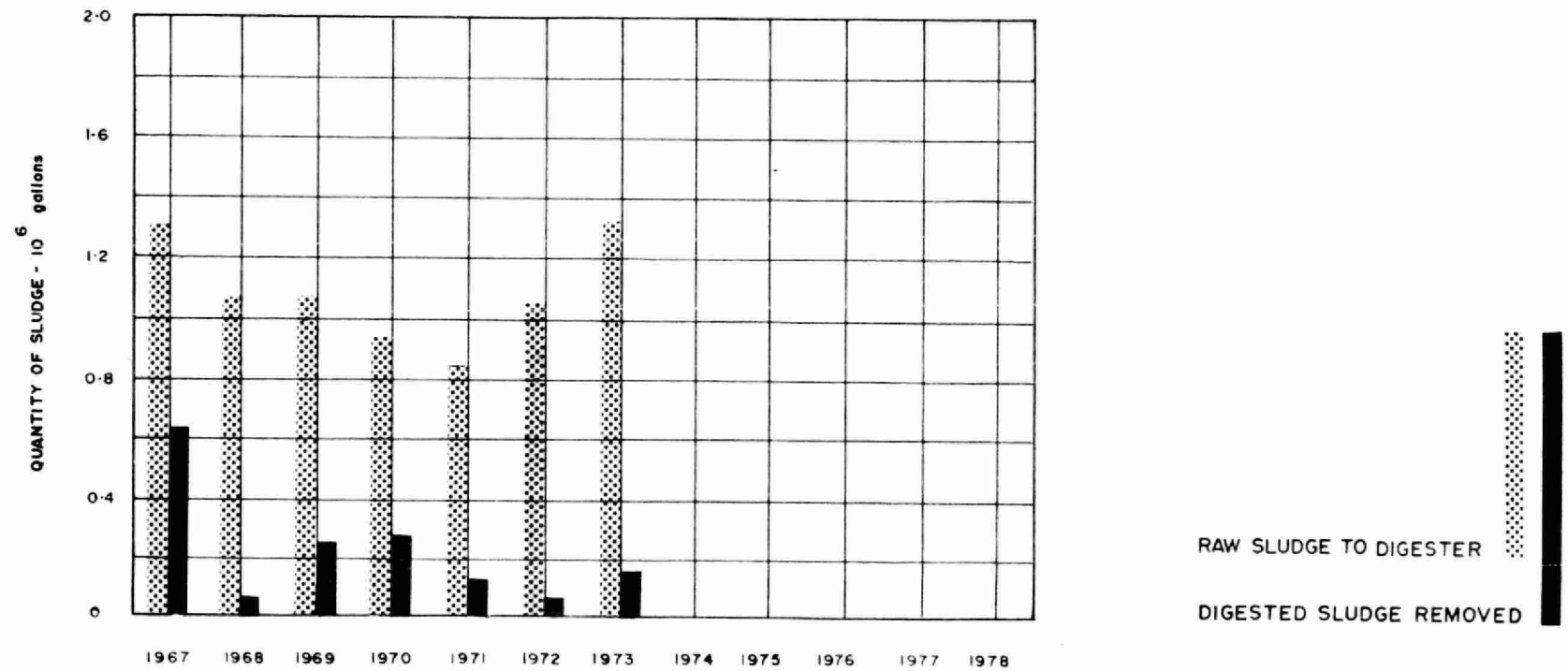
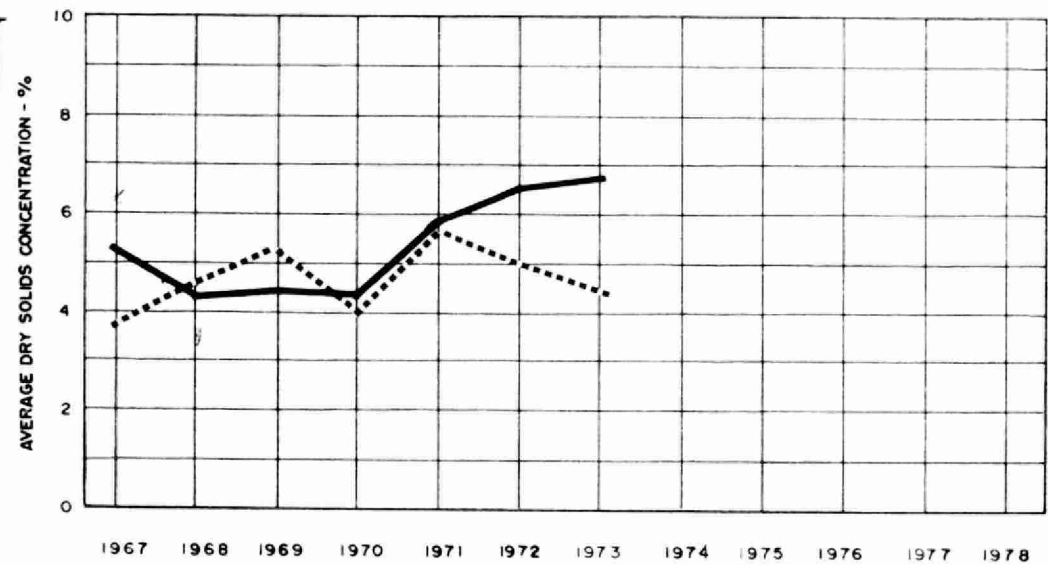


PHOSPHORUS



DIGESTION

RAW SLUDGE
DIGESTED SLUDGE ———



TREATMENT DATA

MONTH	GRIT	CHLORINATION		PRIMARY EFFLUENT		AERATION			SLUDGE DIGESTION and DISPOSAL							
	QUANTITY REMOVED	CL ₂ USED	AVG DOSE	BOD	SUSPENDED SOLIDS	MLSS CONC	F/M	AIR	RAW SLUDGE			DIGESTED SLUDGE			SUPER-NATANT	AMOUNT
	cubic feet	pounds	mg/l	mg/l	mg/l	mg/l	day ⁻¹	1000 ft ³ lb BOD	QUANTITY 10 ³ gallons	TOTAL SOLIDS %	VOL. SOLIDS %	QUANTITY 10 ³ gallons	TOTAL SOLIDS %	VOL. SOLIDS %	T. S. %	HAULED cubic yards
JAN	50			190	130	1530	0.35	1.0	79			10			0.06	
FEB	10			230	200	2150	0.27	0.9	104			10	7.0		0.11	
MAR	25	602 *	2.1	150	200	2020	0.18		105			18	2.5	28	0.10	
APR	54	1056	2.5	210	150	2620	0.16	1.2	105						0.08	
MAY	25	1961	4.4	240	170	3210	0.15	1.1	125			10	9.0		0.08	
JUNE	25	1770	4.7	190	140	2720	0.15	1.1	121			16	7.2		0.17	
JULY	50	1784	4.4	180	160	3050	0.01	0.9	105			18	6.0			103
AUG	25	1613	3.6	200	170	2740	0.02	0.9	110			20	7.0			59
SEPT	30	1723	3.7	200	360	660	0.65	8.2	109			15				90
OCT	30	1486	3.1	200	190	1570	0.27	0.8	112			15			0.20	90
NOV	50	2069	3.7	210	230	2300	0.19	0.7	112	6.0		5	7.0		0.05	30
DEC	27	2673	4.4	220	200	2810	0.17	0.7	109	3.0		11	9.0			64
TOTAL	401	16737	-	-	-	-	-	-	1296	-	-	148	-	-	-	
AVG.	0.7 cu. ft./mi. gal	1395	2.9	200	190	2280	0.21	1.6	108	4.5		12	6.8	28	0.11	73

* Started March 14th

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